DESIGN OF TECHNOLOGICAL FRAMEWORK FOR BUSINESS INTELLIGENCE IN MEDIUM AND LARGE ENTERPRISES

डिज़ाइन ऑफ़ टेक्नोलॉजिकल फ्रेमवर्क फॉर बिज़नेस इंटेलिजेंस इन मीडियम एंड लार्ज इंटरप्राइजेज

A Synopsis

Submitted in partial fulfilment of
Registration in Doctor of Philosophy

Submitted by:

Baljit Kaur
Roll No: 15149740003

Under the Supervision of

Dr. Vikram Singh

Department of computer Science & Applications
Chaudhary Devi Lal University, Sirsa (Haryana)

A Synopsis for the Registration of Research Degree

On

Design of Technological framework for Business Intelligence in medium and large enterprises

Submitted by:

Baljit Kaur

Roll No: 15149740003

Under the Supervision of

Dr. Vikram Singh

Department of computer Science & Applications, CDLU, Sirsa

CONTENTS

	Page No
1. INTRODUCTION	3
1.1 Definition of Business Intelligence	4
1.2 Applications of Business Intelligence	4
1.3 Role of Business Intelligence	5
2. REVIEW OF LITERATURE	6
3. PROBLEM DEFINITION	9
3.1 Importance of Study	10
4. RESEARCH OBJECTIVES AND METHODOLOGY	11
4.1 Research Objectives	11
4.2 Research Methodology	11
4.3 Scope of Study	12
4.4 Data Sources and Analysis	12
5. TENTATIVE CHAPTERSCHEME	12
REFERENCES	13

1. INTRODUCTION

In today electronic environment organizations assemble, understand and bind their data to make effective practical decision in order to improve business operations. Top management needs more accurate information in order to make effective decisions, KaulaAnd Rajiv (2015). As far as existing systems are concerned, they are not able to make fast decisions and are not able to analyze large amounts of data that may be stored in different locations. In addition, especially in the online business industry there is a huge amount of data, which should be used for different applications; managers are either not aware or familiar with BI processes, Panda (2012). According to Xu (2010), managers need the right information at the right time and the right place. Business intelligence technology is the solution for this problem. Business intelligence is giving the competitive advantage to different organizations through various data mining tools.

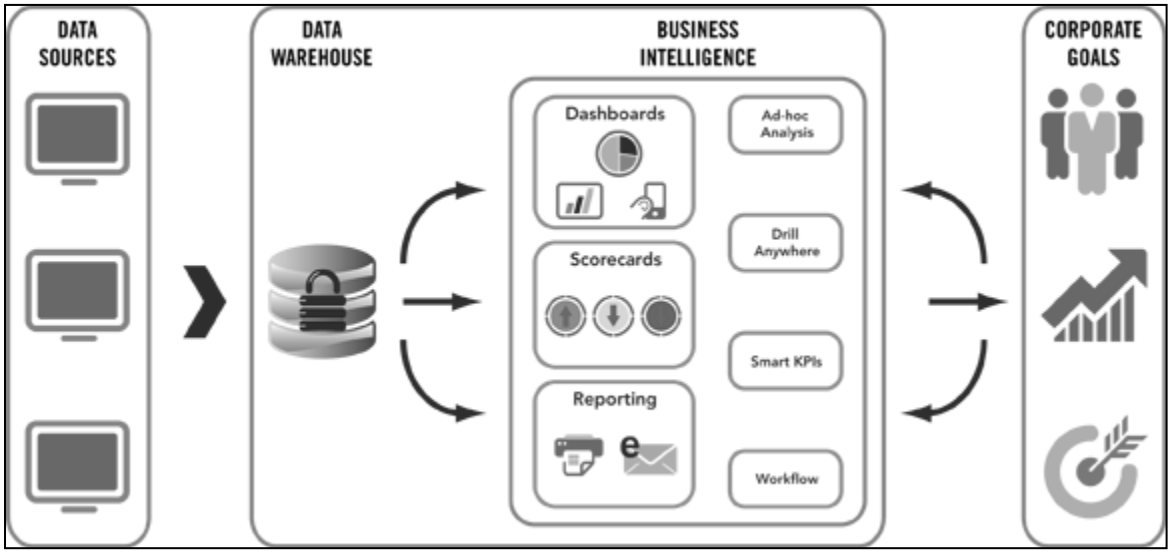

Figure1: The Business Intelligence Ecosystem - Source: Motivity Solutions (2016)

Business intelligence analyzers argue that immediate data are also fundamental for organizations that wish to grab new opportunities rapidly or adapt when customer response to a promotion exceeds expectations, Gartner (2013). Fundamentally, business intelligence solutions provide capabilities to companies to extract, cleanse, and aggregate data from operational tools into a separate data mart. Dobrev et al. (2015) found that business intelligence (BI) is a computer based technique used in finding and analyzing business data, such as sales revenue by products and/or departments, or by associated costs and incomes. As

per Salehi and Gemba (2014) BI includes technologies such as data integration, data quality, data warehousing, data mining, master data management, text and content analytics, and many others.

Salehi and Gemba (2014) stated that common functions of business intelligence technologies are reporting, online analytical processing, analytics, data mining, business performance management, benchmarking, text mining, and predictive analytics. Business intelligence technologies provide historical, current, and futuristic views of business operations. Because Business intelligence supports better business decision-making; thus a business intelligence system can be called a decision support system (DSS), Ivan and Mihaela-Laura (2014). Business intelligence helps organizations to understand their opportunities in growth of sales and profit, to identify customer's buying patterns. With implementing business intelligence organizations can improve their overall decision making, Petrini and Pozzebon(2008).

1.1 Definition of Business Intelligence

An umbrella term that encompasses data warehousing, reporting, analytical processing, performance management and predictive analytics (White,2004). A combination of products, technology and method to organize key information that management needs to improve profit and performance(Williams and Williams,2007). According to Seeley and Davenport(2006), Business Intelligence is the extraction of insights from structured data.

1.2 Applications of Business Intelligence

According to Salehi and Gemba (2014), Business Intelligence can be applied to the following business purposes:

- Measurement: Program that informs top management about progress towards business goals.
- Analytics**:** Program that builds quantitative processes for a business to arrive at optimal decisions and to perform Business Knowledge Discovery.

- Reporting/Enterprise Reporting: Program that builds infrastructure for Strategic Reporting to serve the Strategic management of a business, NOT Operational Reporting.
- Collaboration/Collaboration platform: Program that gets different areas (both inside and outside the business) to work together through Data sharing and Electronic Data Interchange.
- Knowledge Management: Program to make the company data driven through strategies and practices to identify, create, represent, distribute, and enable adoption of insights and experiences that are true business knowledge.

1.3Role of Business Intelligence

Business Intelligence evolved through old manual systems to management Information systems (MIS).These manual systems had effectively provided the necessary reports for management and regulatory requirements, Williams and Williams (2007). These systems worked well till the scale of operations were small. As the organization grew in size and expanded geographically, manual operations became time consuming and error prone. The manual management information system had the drawbacks like data is laying in different locations, time lag in data collection, data quality is poor, unavailability of customer specific data was not available to decision makers, Subramaniam(2009). Slowly, majority of the organizations began using information technology for MIS. These earlier initiatives laid the foundations of Business Intelligence. Business Intelligence tools can be used for:

- Historical analysis
- Performance budgeting
- Business performance analytics
- Employee performance measurement
- Executive dashboards
- Marketing and sales automation
- Product innovation
- Customer profitability
- Regulatory compliance
- Risk management

Organizations can analyze their historical performance over time to be able to plan for the future. Analyzing, interpreting and acting upon on the information are subjective exercises. Hence, the Business Intelligence vendor shifted their focus to electronic customer relationship management (CRM), Airinei and Berta (2012). Customer relationship management continues to be the centre of the attraction and risk management comes to second. Customer relationship management is at the centre stage of Business Intelligence. However, it is becoming difficult to assess whether it is driven by technology or business. It includes all business processes in sales, marketing, and service that touch the customer, Kaula and Rajiv (2015). According to Dobrev et al. (2015), With customer relationship management, organizations can build a database about its customers that describes relationships with sufficient detail so that management, salespeople, service people, and even the customers can access information, match customers needs with product plans and offerings, remind customers of service requirements, check payment histories, and so on.

The most crucial and daunting task for companies are to create an enterprise wide repository with 'clean' data of the existing customers, Gartner (2012). It is well established that the cost of acquiring a new customer is far greater than in retaining an existing one. The transition from a product-oriented business model to a customer-oriented one is not an easy task for online industry. Most of the Business Intelligence applications cater to the needs of the top management. But, line managers have a different set of Business Intelligence requirements, which differ from those of the top management, Gartner (2013). The line managers require operational business intelligence.

2. REVIEW OF LITERATURE

In this section we discuss theoretical bases for evaluating the business intelligence and its benefits of in various aspects. It is also important to review all the Business Intelligence aspects. ICT revolution has fundamentally changed the business by scaling borders and bringing about new opportunities, (Chi, Yiua, Grantac and Edgarc, 2007). In India also, it has strongly impacted the strategic business considerations by significantly cutting down costs of delivery and transactions. Business Intelligence systems are considered an evolution of Decision Support Systems (DSS) – IT-based solutions that can be used to support complex

decision making and problem solving (Shim, 2002). Management Information Systems (MIS) primarily focus on structured decisions; hence IS for semi-structured and unstructured decisions should be termed DSS (Power, 2007).

Business analytics makes extensive use of data, statistical and quantitative analysis, and explanatory and predictive modeling to help make actionable decisions and to improve business operations. There are many kinds of business analytics, real-time vs. non-real-time, strategic vs. tactic, planned vs. unplanned, and structured vs. unstructured (Chan, 2012). According to Das and Kumar (2013), the volume of the digital data will grow to 8 Zettabytes by 2015, which is equivalent to 18 million Libraries of Congresses, 90 percent of which will be unstructured data in the next decade, including text, document, image, video, and other forms of social media data. Managers have used business analytics to inform their decision making for years. Now, they are using business analytics not only in analyzing past performance but also in identifying opportunities to improve future performance (LaValle, Lesser, Shockley, Hopkins, & Kruschsitz, 2011).

Wills (2014) suggests that applications of big data analytics in healthcare industry may begin with small data analytics since it is much more appropriate for healthcare managers and organizations to translate data and to have actionable intelligence based on current infrastructure in the healthcare systems. According to Chen, Chiang, and Storey (2012), business analytics consists of big data analytics, test analytics, web analytics, network analytics, and mobile analytics, many of which are unstructured and cannot be analyzed by relational database management tools. Fitzgerald (2014) points out that there are three types of career categories for graduates majoring in big data business analytics: top pier management consulting, financial and risk analysts, and data scientists.

According to Watson, Wixom, and Ariyachandra (2013), critical skills for business analytics include optimization analytics, descriptive analytics, and predictive analytics. Business analytics focuses on developing new insights and understanding of business performance based on data and statistical methods, Wills (2014). Big data is used to characterize data sets that are large, diverse and rapidly-changing, as seen by ever increasing numbers of organizations. Big data require database management systems with capabilities beyond those

seen in standard SQL-based systems, LaValle, Lesser, Shockley, Hopkins, & Kruschsitz (2011).

There is an array of applications for Business Intelligence, classified under three broad headings (Petrini and Pozzebon, 2009):

1. Analysis - Data Mining, OLAP and Statistical tools for interactive inquiries which present aggregated data and permits "Slice and Dice" and "Drill Down" into cube measures and dimensions, Chaudhuri and Dayal (1997). For advanced reporting and visualization users can utilize statistical tests (e.g. SPSS, SAS) which represent a proactive approach by not only reflecting what already happened but predicting future behavior.

2. Monitoring - Dashboards, Scorecards and Alert systems tools for snapshot overview of current business status. These applications provide a review on business measurements and key performance indicators (KPI), enabling business performance management (BPM) initiatives, Few (2006). In a single or few screens, users can quickly see how actual performance compares to goals, benchmarks, and previous performance, Al-Natsheh (2010).

3. Reporting – usually pre-defined and structured formats of reports that are distributed to end-users, such as an Excel spreadsheet that offers limited Business Intelligence capabilities in the form of pivot tables, Chou & Cheng (2006).

According to Buchanan and O'Connell (2006) information systems field has witnessed the rapid development of systems and software applications providing support for business decision making since the concept of business intelligence (BI) was introduced in the late 1980s (Chaudhuri, Narasayyaand Dayal, 2011). Organizations started migrating to complete Business Intelligence environments so that they could have a "single version of the truth" through the use of cross-organizational data, provided by an integrated architecture, Negash (2004). Organizations need new tools and techniques to improve performance and profits and also to meet the expectations of customers and in order to stay competitive in today's highly aggressive business world, Williams and Williams (2007).

Although many organizations have implemented Business Intelligence but it was found that not all the Business Intelligence initiatives have been successful, Petrini and Pozzebon (2008). Researchers have discussed the reasons for success and failure extensively. Various approaches to examining Business Intelligence capabilities may be one of the reasons behind the gaps in the research about Business Intelligence success, Barrento (2010). A lack of fit between the organization and its Business Intelligence capabilities is one of the reasons for lack of success (Watson and Wixom, 2007). According to Manyika, Chui, Brown, Bughin, Dobbs, Roxburgh, & Byers (2011), most organizations still experience a lack of Business Intelligence (BI) in their decision making processes when implementing enterprise systems, such as Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), and Supply Chain Management (SCM). Companies are using Business Intelligence tools today to do things like calculate the profitability of millions of individual customers daily, track the navigation path of every visitor to a Web site, identify fraudulent activity for thousands of transactions in real time, and provide service reps a 360-degree view of customer activity in near real time, Wills (2014).

Organizations today collect enormous amounts of data from numerous sources, and using Business Intelligence to collect, organize, and analyze this data can add great value to a business (Gile, Kirby, Driver, Murphy and Teubner, 2006). Business intelligence (BI) is the top priority for many organizations and the promises of Business Intelligence are rapidly attracting many others (Evelson, McNabb, Karel, and Barnett, 2007). BI can also provide executives with real time data and allow them to make informed decisions to put them ahead of their competitors, (Chaudhuri, Narasayya and Dayal, 2011). Des MARAIS (2011) noticed that although Business Intelligence matters so much to so many organizations, there are still inconsistencies in research findings about Business Intelligence and Business Intelligence success. According to Panda (2012) organizations are unable to get right data at right time in right place because data stored in repository are of different Business dimension from various data source which leads to problems such as operational inefficiency.

One of the goals of Business Intelligence is to support management activities. Computer based systems that support management activities and provide functionality to summarize and analyze business information is called management support systems (MSS), (Clark,

Jones and Armstrong 2007). Decision support systems (DSS), knowledge management systems (KMS), and executive information systems (EIS) are examples of MSS, (Elias, Aufaure and Bezerianos, 2013). These systems have commonalities that make them all MSS. Various definitions of BI have emerged in the academic and practitioner literature. While some broadly define Business Intelligence as a holistic and sophisticated approach to cross-organizational decision support, others approach Business Intelligence from a more technical point of view, (Cheng, Lu and Sheu, 2009).

Research Gap

Using the concepts of business intelligence applications including data mining, organizations will be able to better understand the key success factors in creating new products for customers. A critical success factor of business intelligence implementations is the ability to create a real-time analytics link between the demand management, channel management, production planning and production operations. Business intelligence's many applications that interpret data from often dozens of databases to ultimately manage the value chain of an organization to the highest levels of efficiency possible.

3. PROBLEM DEFINITION

The implementation of business intelligence is a complex undertaking when compared to other information technology initiatives; reason behind this is that it requires large amount of organizational resources and consistent improvement effort. Moreover, role of data is critical in most organizations but there are some industries that need data more quickly and more accurately to analyze very large amounts of data from different sources. In the online business environment security, privacy and risk factors plays a very important role. It is very difficult to analyze trust because of the complexity and risk involved in electronic environment, Cheng et al. (2009). All these aspects will be the decisive factor for success or failure of business intelligence. There are some issues pertaining to the implementation of business intelligence like:

- Current State of business intelligence
- Poor Understanding of business intelligence Implementation and Its Values

- Shortcomings of Existing business intelligence tool
- Uncertainty on the Path to Follow

The problem stated in this research is that various organizations are dealing with big amount of data on daily basis, but very less number of them have the ability to convert these data to information and other are not enough familiar with the concept of business intelligence. In addition, they do not know how they use business intelligence tools and in which levels of implementing business intelligence they are in because they have no framework to measure the uses of business intelligence, little is known about whether organizations are getting the information and services needed or about the state of the practices of implementation of business intelligence.

The research questions of this research are as follows.

- What is the maturity level of business intelligence tools/processes?
- What are the most important areas of improvement and strengths of business intelligence processes?
- What is the effect of implementation of business intelligence on various organizations?

3.1 Importance of the study

For so many years, organizations collect and stored huge amount of data in order to obtain some valuable outcome. This has been around for many years. Unprocessed data doesn't have sufficient benefit for making decisions, and that their actual value depends on organization's ability to analyze those data. Therefore the needs for software systems which are equipped to recover, abbreviate, and understand data emerged for end-users. This need stimulated the emergence of many of business intelligence companies that are specialized in providing software systems and services for digging up knowledge from raw data. These software systems would analyze a company's operational data and provide knowledge in the form of tables, graphs, pies, charts, and other statistics. This kind of knowledge is very critical as far as success and failure of organization is concerned.

Internationally, some efforts are being made to develop business intelligence acceptance modal, but in India no systematic measure has been developed for its widespread implementation. So, business intelligence evaluation model is required that is intended to support business intelligence processes. Without a model, it is impossible to determine what variables to measure, what attributes to observe, what data to gather, what questions to ask, what relationship to explore and what scales of measurement to employ.

4. RESEARCH OBJECTIVES AND METHODOLOGY

4.1 Research Objectives

Business Intelligence activities have recently become much more common in developed countries. There have not been many studies researching business intelligence from a practical viewpoint in developing countries like India; therefore, the objective of this study was to find out:

- To study various Business Intelligence tools available in the market and to investigate the need and extent of Business Intelligence activities
- To study how Business Intelligence tools are used to detect and identify potential security threats
- To study how feedback and recommendation mechanisms (FRM) can be integrated with Business Intelligence software
- To study the effect of unstructured data in an organization
- To develop effective and efficient business intelligence model for management of unstructured data

The study examines the current maturity level of business intelligence activities as well as the future prospects concerning business intelligence in Indian IT and non IT based enterprises. The research will also examine key areas of improvement in business intelligence operations and benefits gained from Business Intelligence.

4.2. Research Methodology

It has been considered appropriate to study a considerable sample from each from medium and large enterprises. The universe of population is the IT and non-IT based medium and large enterprises that are using online environment for business dealings. A detailed survey of 200enterprises would be carried out in the selected areas of north India in order to study the enterprises' aspects. The north India would comprise for the present study in the selected cities of Punjab and Haryana.

To study the business intelligence developers' aspects, a sample of 50 business intelligence service provider companies will be selected and developers will be interviewed as these are the persons who are actually experience and deals with business relations and implementation of business intelligence in routine. The respondents would be interviewed through a structured and pre-tested questionnaire.

4.3. Scope of study

The study primarily focuses on implementation of business intelligence in medium and large enterprises (IT and non IT enterprises). The researcher would identify the sampling frame from which the data should be drawn. For a sample to be representative, it should summarize all relevant information about the parent population contained in the sample. Participants in the survey were asked a number of demographic questions to establish representativeness by comparing the sample with the whole population of various enterprises. The present study is confined to selected areas of northern part of India. The respondents for the study will be those enterprises. The study is descriptive as well as exploratory in nature.

4.4. Data Source and Analysis

For this study, data will be collected both through the fieldwork and the paperwork. The primary data will be collected through well-structured and pre-tested questionnaire. In order to ensure depth and internal consistency of the questionnaire a pilot study will be conducted. The questionnaire will be formalized carefully taking into consideration the objectives of the study. The questionnaire will be designed on the basis of the study of the existing research

literature and brainstorming sessions with the academicians and personnel from various organizations. The secondary data will also be used, wherever necessary, in the present study.

The data analysis will be undertaken with according to requirements of study and objectives. Various tables, diagrams and charts will be incorporated to make it more useful and easy to understand. To make study more reliable, various statistical techniques like standard deviation, correlation, regression analysis, Chi-square, Cramer's V, t-test, F-test may be applied using SPSS software.

5. TENTATIVE CHAPTER SCHEME

Chapter 1: INTRODUCTION

Chapter 2: LITERATURE REVIEW AND RESEARCH DESIGN

Chapter 3: BUSINESS INTELLIGENCE TOOLS AND TECHNOLOGIES

Chapter 4: KEY BUSINESS INTELLIGENCE INDICATORS IN SECURITY THREATS

Chapter 5: EFFECTS OF UNSTRUCTURED DATA

Chapter 6: BUSINESS INTELLIGENCE TOOL FOR UNSTRUCTURED DATA

Chapter 7: CONCLUSION

REFERENCES

Airinei, D., Berta, D. (2012). Semantic business intelligence – a new generation of business intelligence, InformaticaEconomica 16.2: 72-80.

Al-Natsheh, H.T. (2010). Commercializing computational intelligence techniques in a business intelligence application; Congress Evolutionary Computation (CEC), IEEE Congress on Digital Object Identifier. Page(s): 1 – 7 IEEE Conferences.

Barrento, M.P.A (2010). Business intelligence applied to Homogeneous Diagnostic Groups. Information Systems and Technologies (CISTI), 5th Iberian Conference, Page(s): 1 – 5 IEEE Conferences.

Buchanan, L. and O'Connell, A. (2006). A brief history of decision making. *Harvard Business Review, 84* (1), 32-40.

Chaudhuri, S., Dayal, U., &Narasayya, V. (2011). An overview of business intelligence technology. Communications of the ACM, 54(8), 88–98.

Chaudhuri, S. and Dayal, U. (1997). "An Overview of Data Warehousing and OLAP Technology". ACM SIGMOD (26:1), pp.65-74

Chi, S., Yiua, B., Grantac, K., and Edgarc, D., (2007). "Factors affecting the adoption of Internet Banking in Hong Kong—implications for the banking sector". International Journal of Information Management 27, 336–351.

Chou, T., & Cheng, S. (2006). Design and implementation of a semantic image classification and retrieval of organizational memory information systems using analytical hierarchy process. Omega- International Journal Of Management Science, 34(2), 125-134.

Cheng, H., Lu, Y.-C., &Sheu, C. (2009). An ontology-based business intelligence application in a financial knowledge management system. Expert Syst. Appl., 36(2), 3614-3622.

Clark T. D., Jones, M. C., and Armstrong, C.P. (2007). The dynamic structure of management support systems: Theory development, research focus and direction. *MIS Quarterly*, *31* (3), 579-615.

Connolly, T., Stansfield, M. (2006), Using games-based eLearning technologies in overcoming difficulties in teaching information systems. *Journal of Information Technology Education* 5, 459- 476.
Des MARAIS, C., (2011). Can Small Business Benefit From Business Intelligence Software? [Online] Available at:http://www.si-journal.org [Accessed 4 January 2013].

Dobrev, Kiril, Hart And Mike (2015). Benefits, Justification And Implementation,Planning Of Real-Time Business Intelligence Systems, Electronic Journal Of Information Systems Evaluation 18.2 (Sep 2015): 104-118

Elias, M. Aufaure, M.A. &Bezerianos, A. (2013). Storytelling in Visual Analytics tools for Business Intelligence. 16th ACM Conference on Computer Supported Cooperative Work and Social Computing (CSCW 2013) held February 23-27 in San Antonio, Texas, USA.

Evelson, B., McNabb, K., Karel, R., and Barnett, J. (2007). *It's time to reinvent your BI strategy.* Retrieved from Forrester database, www.forrester.com.

Few, S.(2006). "Information Dashboard Design". O'Reilly, pp.120-206

GARTNER (2012). Gartner Predicts Three Business Intelligence Trends. [Online] Available at:http://www.forbes.com/forbes/welcome/?toURL=http://www.forbes.com/sites/gartnergroup/2015/02/12/gartner-predicts-three-big-data-trends-for-business-intelligence/&refURL=&referrer=[Accessed 13 January 2013]

GARTNER (2013). Gartner Executive Programs' Worldwide Survey of More Than 2,300 CIOs Shows Flat IT Budgets in 2012, but IT Organizations Must Deliver on Multiple Priorities. [Online] Available at: http://www.gartner.com/newsroom/id/1897514 [Accessed 13 January 2013]

Gile, K., Kirby, J. P., Karel, R., Teubner, C., Driver, E. and Murphy, B. (2006). *Topic overview: business intelligence*. Retrieved from Forrester database. www.forrester.com.

Ivan AndMihaela-Laura (2014). Characteristics Of In-Memory Business Intelligence ,InformaticaEconomica 18.3: 17-25.

Kaula, Rajeev (2015). Business Intelligence Rationalization: A Business Rules Approach, International Journal Of Information, Business And Management 7.1: 129-143.

Motivity solutions (2016). Movation Business Intelligence (Bi) Gain Valuable Insight To Improve Business Goals, Accessed from https://motivitysolutions.com/business-intelligence/, June 2016.

Negash, S. (2004). Business intelligence. *Communications of the Association for Information Systems*, *13*, pp. 177-195.

Panda, B. (2012). Problems of Bank for Different Data source and its solution through Business Intelligence. Accessed from http://www.slideshare.net/pandabishnu/problems-of-bank-for-different-data-source-and-its-solution-through-business-intelligence, May 2016.

Petrini, M., and Pozzebon, M. (2008). "What role is “Business Intelligence” playing in developing countries? A picture of Brazilian companies. In: Rahman, Hakikur (Eds.), Data Mining Applications for Empowering Knowledge Societies, IGI Global, pp. 237–257.

Petrini M., and Pozzebon, M.(2009). “Managing sustainability with the support of business intelligence: Integrating socio-environmental indicators and organizational context”. Journal of Strategic Information Systems 18 (2009) 178–191.

Power, D.J., (2007). "A Brief History of Decision Support Systems". version 4.0 http://dssresources.com/history/dsshistory.html.

Salehi, M. and Gemba, T. (2014). Wholesale Banking - Evolution & Change. Accessed from https://www.linkedin.com/pulse/20141129014638-19040631-wholesale-banking-evolution-change, June 2016.

Shim J.P., Warkentin M., Courtney J.F., Power D.J., Sharda R., Carlsson C. (2002). "Past, present, and future of decision support technology". Decision Support Systems 33, 111 –126.

Subramaniam, L.V (2009). Business Intelligence from Voice of Customer. International Conference Data Engineering, ICDE '09. IEEE 25th International Conference on Digital Object Identifier. Page(s): 1391 – 1402 IEEE Conferences.

Watson, H.J., Wixom, B.H., Hoffer, J.A., Anderson-Lehman, R., and Reynolds, A. M. (2006). Realtime business intelligence: Best practices in Continental Airlines. *Business Intelligence,23*(1), 7-18.

Watson, H. J. and Wixom, B. H. (2007). Enterprise agility and mature BI capabilities. *Business Intelligence Journal*, *12* (3), 13-28.

Williams, S. and Williams, N. (2007). *The profit impact of business intelligence*, San Francisco, CA: Morgan Kaufmann, pp 178-189.

Xu, Xi (2010). Developing a Framework for Business Intelligence Systems Integration Based on Ontology.. ICNDS '09. International Conference Networking and Digital Society on Volume: 2 Digital Object Identifier. Page(s): 288 – 291 IEEE Conferences